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ABSTRACT

The purpose of this study was to investigate the impact of the implementation experience on an educational innovation. The topic suggests that users impact innovations just as innovations impact the user. The study's paradigm for implementation has three components--program specifications, the procedures specified for the innovation; user practices, the ways the user performs the task prior to the introduction of the innovation; and operational characteristics, the actual manner in which the user operates the innovation. In this paradigm, implementation is conceived as a bilateral event: both the innovation and user are altered. Two types of mutual adaptations were identified in the elementary reading and mathematics programs examined--those that were mixtures of and those that were actually different from the related program specifications and user practices. Conditions affecting alterations to the programs were the non-dynamic features of the user's environment, the other programs that the user operates, emergent innovations, the incompleteness of the innovation, ramifications of other alternatives, and the evaluative judgments of the user. This study has clearly shown that the innovation was impacted during implementation. (Author/IRT)

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THE IMPACT OF THE IMPLEMENTATION EXPERIENCE ON AN EDUCATIONAL INNOVATION

by

William P. Frey

Paper presented at the Annual Meeting of the American Education Research Association, New York, N. Y. April, 1977.

EA 009 674

BACKGROUND OF THE STUDY

The purpose of the study is to investigate the impact of the implementation experience on an educational innovation. The topic suggests that users impact innovations just as innovations impact the user. The interactive effects of these impacts is an important element of implementation. It is the gap between theory and practice as well as the unification of theory and practice.

In this study implementation is thought of as a process during which the innovative system and the user system are altered. The innovative system is a specified way of performing a task such as the teaching of reading. The task may be a different way of performing a function which is part of the user system or it may be a task which is completely new to the user's system. Although the innovation may be similar to the user system, it is innovative only because it differs, in some respects, from it.

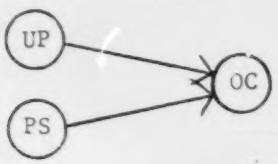
In this study the innovative system is seen as a fairly clear set of procedures for the user to follow. These procedures shall be referred to as the program specifications or PS.

The user system shall be called the user practices or UP. The user practices are the ways the user performs the task prior to the introduction of the innovation.

The actual manner in which the user operates the innovation shall be called the operational characteristics or OC. It should be noted that the operational characteristics of an innovation may be quite different than the program specification. This is consistent with the notion that implementation is a process in which both the innovation and user systems are altered.

Figure 1 serves as a basic paradigm for implementation. It shows the user practices (UP) and program specifications (PS) interact and result in the operational characteristics of the innovation. This paradigm will be elaborated on as the study develops.

Figure 1
Paradigm for Implementation



This paradigm for implementation conceptualizes change as a bilateral event: both the innovation and the user are altered. This particular view of change may be identified in the philosophic writings of Fabun (1976), Fuller (1972), and Suzuki (1973). In psychotherapeutic writings, it has been called "reciprocal impact" by Knell and Mueller (1966) and has been discussed by Jourard (1968) and Laing (1969). A similar vantage point has been adopted by Churchman and Schainblatt (Feb. and Oct. 1965), to study the gap between the manager and management scientist.

Within implementation studies the concept of bilateral change has been expressed by Beers (1975), Havelock and Havelock (1973), and Miles (1967). Hall's Concerns-Based Adoption Model (1974), while focusing on user activities, clearly indicates the essence of bilateral change. Studies of mutual adaptation have shown how the user and innovation are altered during implementation (Mann, 1975; McLaughlin, 1975 and Wirt, 1975). The paradigm for implementation also shows that the operational characteristics are outside of the user and innovation. This is intended to show that they are unique and unpredicted by the user and innovation. Fuller (1972) has referred to this event as synergism. The synergy of implementation has been recognized in the writings of Havelock and Havelock (1973) and Colvard (1967). Hall's Concerns-Based Adoption Model clearly illustrates the application of synergy to implementation.

PRESENTATION AND ANALYSIS OF DATA

1. Introduction

The major elements of the study are the innovation's program specification, the user's practices prior to implementation and the operational characteristics of the innovation. The innovation and user were related through the Follow Through sponsorship program as previously described. The innovation of concern to this study is the Learning Research and Development Center's (LRDC) Follow Through Instructional Model. The user is a large rural school district in central Pennsylvania. Seven elementary schools in the district use the innovation in kindergarten through grade three. Schools at extreme ends of the district are fifty miles apart. LRDC and the school district worked together for seven years at the time of this study.

Control of implementation has been maintained by supervisors employed by the school district and consultants employed by LRDC. Teacher contact concerning the innovation has been in the form of pre-service training, in-service training and classroom supervision.

This particular user was selected for the study because of the extensive alterations it had made to the innovation. It does not necessarily represent all users of the LRDC programs.

The question being asked is, "What is the impact of the implementation experience on an educational innovation?" The second chapter of this study discussed the question theoretically. That discussion pointed to the view of the bilateral change and synergism as events of implementation. The paradigm presented in Figure 1 and extended in Figure 2 represent the merger of the program specifications and the user practices to form the operational characteristics. The research design uses this paradigm as its basis and expends upon it by identifying the program specifications, the user practices that are

related to each program specification, and the operational characteristics of the innovation. Analysis of the data involves the following procedures.

First, the theoretical notions of bilateral change and synergism are applied to the data. If bilateral change and synergism are applicable notions, then the operational characteristics ought to be different than the user practices and the program specification. The concept of mutual adaptation as presented by Mann (1975), McLaughlin (1975), and Wirt (1975); and discussed in the second chapter of this study, is used to see if both the user and the innovation have been altered.

Secondly, the operational characteristics are compared and contrasted with the program specification to determine how and why implementation has impacted the innovation.

2. Presentation of the Data

The data used in this study are statements describing the innovation's program specifications, the operational characteristics of the innovation, and the user practices prior to implementation.

The innovations in this study are four instructional programs: (a) Sullivan Reading Program (adapted by LRDC), (b) Selected, Directed and Skills Reading, (c) the Primary Education Project (PEP), and (d) IPI Math. These four programs, working together, form the basis for the LRDC Follow Through Instructional Model. In first grade students begin the Sullivan Reading Program and, upon completion, enter the Selected, Directed and Skills Program. The PEP curricula is generally thought of as a kindergarten program although its use sometimes extends to the first grade. It consists of the Classification and Quantification programs, and a Perceptual Development Program that contains auditory motor, visual motor, general motor and letters and numerals curricula. When students complete Quantification, they begin the IPI Math program.

The development of these four programs may be thought of as occurring in four distinct stages. The first stage involved the creation of a philosophic foundation for the programs. They are stated here as aims for program developers:

a. To provide for reliably assessable individual differences among learners,

b. to develop mastery of subject matter as the child moves through the curriculum,

c. to develop self directed and self-initiated learners through instructional procedures which provide for self-selection and self-evaluation, and

d. To provide opportunities for the child to become actively involved in the learning process. (Bolvin and Glaser, 1968, p. 829)

The second stage of development concerned the way the programs were to be designed so that the aims would be achieved. The following is a retrospective description of those design goals:

a. Structured Curriculum - Each content area is comprised of a series of behavioral objectives arranged in a hierarchical order. These series of objectives serve as the content, scope, and sequence guide for learning.

b. Individualized Instructional Materials - Individualized materials are identified from commercial sources, or developed at LRDC and on-site to match the curriculum objectives.

c. Assessment System - Criterion referenced tests are part of an individual diagnostic and prescriptive procedure for placement of individual students in the curricula, guiding educational experiences, and for feeding back information to the student and teacher.

d. Management System - A management system designed for the individualization process enables teachers to identify and provide individual educational programs and learning experiences through the understanding of the teacher role, the development of self-management skills in students, and the organization of the classroom. (Eichelberger & Boston, 1976, pp.3-4)

In the third stage, the designers developed programs that reflected these goals and aims. During the fourth stage these products were field tested for usability. If necessary, the programs were altered using the principles and aims as a blueprint.

These programs, along with their teacher guides, contain what this study is calling program specifications. The writer has extracted the specification from various documents. They were verified by the LRDC Field Services staff and the site supervisory staff.

A primary consideration in the development of the list was the level of specificity that would be used. If the program specifications were too general, they may not serve to discriminate between the design of the program and the way site was operating it. If they were too specific, one would find each teacher operating the program differently. The final list seems to be of an appropriate specificity. It discriminated between the design of the program and site's operation of it.

A second major consideration concerned the brevity with which the list could be constructed and still be useful in data collection. With this consideration in mind, such items as complete listings of instructional objectives and materials were excluded. Also, abbreviated notations were used when possible. (Although the process of data collection will be attended to later, it should now be noted that the writer collected that data and discussed each specification in detail to ensure that the respondent and he agreed upon its meaning.) Because of the brevity of the list, the reader who lacks operational familiarity with the programs is likely to find it difficult to comprehend. The list of program specifications is found in the Appendix.

Gathering data concerning the operational characteristics of the programs at site relied on the following procedures. First, the writer met individually with each of the three Educational Specialists (i.e., supervisors) at the site's Follow Through Program. Each Specialist assumes responsibility for either PEP, math or reading. In the meetings the writer presented each specification and asked the Specialist to describe how it was operationalized there. The responses were recorded. This procedure was used to prepare a first draft of the operational characteristics for each program. The list was returned to the Educational Specialists for their approval.

During ensuing visits to the site, the writer observed each characteristic operating in at least three classrooms for further verification. When discrepancies existed between the observations and Educational Specialists report, which happened only occasionally, the writer interviewed the teacher and/or redefined the characteristics. Some operational characteristics were unobservable. In these cases, the writer discussed the characteristics with the teachers to either verify or redefine it based on the teachers comments. Thus, a second draft of the operational characterists was prepared.

Finally, the second draft was presented to the Educational Specialists for their information and final approval. Their comments tended to be further elaborations upon the data and were incorporated in the third and final version of the characteristics which is found in the Appendix.

Curricula structure, instructional materials, and assessment and management systems are as much a part of a conventional school as they are of the innovation. That is, a structural correspondence exists between the systems. This is referred to here as an analogical relationship. The user practices are the pre-implementation activities of the user, that are analogically related to the program specifications. How the users organized their activities, and what their purpose was, is not of central interest to this study. What is of interest is, what the user did in relation to each altered program specification.

These were not documented prior to implementation and the writer's attempts to gather them from documents and interviews were unsuccessful. Thus, the writer generated them from his experiences in public schools. The program specifications and operational characteristics served as a context for the generation activity. The user practice had to (a) be in analogical relationship to the program specification and user practice and (b) have the potential of contributing to the direction of the alteration.

In some cases it was not possible to generate a user practice and in some cases the one generated seems to be contrived. Occasionally, a user practice is a statement denying that a practice extisted rather than establishing one. However, to the extent possible, the user practices describe how the user operated prior to implementation.

Since the user practices were generated in the context of program specification and operational characteristics, they are also displayed in that context, (see Table 1). Table 1 displays a condensed version of the data concerning the program specifications, operational characteristics and user practices. Rudimentary analytic information is also contained on that table.

The major headings on the table refer to the specific instructional programs which compose the innovation. As sub-headings under each instructional program are the operational characteristics of that program. The first two columns under each operational characteristic contain the related program specification and user practice.

In the third column is a description of how the operational characteristic may be viewed as a mutual adaptation. This is an important step in determining the applicability of bilateral change and synergy to implementation. Also, in that third column is a brief rationale for the alteration. These were provided by the user during data collection.

The fourth column states the ramifications of the alteration being discussed. That is, a change made to a program specification may cause changes in other related program specifications.

Table 1

Operational Characteristics and Related Program Specifications,

User Practices, Mutual Adaptations and Ramifications

A. Sullivan Reading Program (adapted by LRDC)

1. (OC) The pre-reading and reading readiness section of the Sullivan Reading Program teaches the sounds required by the Sullivan Program and all consonant sounds.

Program Specification	User Practice	Mutual Adaptation	Ramification
The pre-reading and reading readiness program teaches the sounds required by Sullivan	Pre-reading and reading readiness were taught in kindergarten and prepared students for first grade readers.	Site uses the techniques of pre-reading and reading readiness. The innovation now includes the teaching of all consonant sounds. (Site does not necessarily track students from Follow Through kindergartens to Follow Through first grades. Thus, it is necessary to prepare students for non-Follow Through reading programs by teaching all consonant sounds.)	The alteration to the objectives also altered the materials.

2. (OC) Sullivan materials are used for pre-reading and reading readiness.

Teacher made materials are used for pre-reading and reading readiness.	Site did not use Sullivan pre-reading and reading readiness materials.	Both site and the innovation now use Sullivan pre-reading and reading readiness materials. (This introduces students to the skills and format of Sullivan Book 1.)	This alteration effected the objectives of the pre-reading and reading readiness programs.

Table 1 Continued

3. (OC) The Group Directed and Directed Reading programs use the materials and objectives of a basal reading text.			
	The Group Directed and Directed Reading programs use the materials and objectives specified in their lesson plans.	The reading program used in the primary grades prepared students for the intermediate reading program.	Site now uses the Selected and Skills reading programs. The innovation has acquired a basal text, which includes its own skills program, in place of Directed Reading. (The Group Directed Reading programs were not preparing students for the intermediate grades. The use of basal texts makes the transition smoother.)	Basal text tests are used to assess progress in the reading program. The time required for Group Directed and Directed Reading has increased.
4. (OC) Unit and End-of-Book Tests are used in Sullivan but mastery is determined by teacher judgement.			
	Specified criteria determines mastery of Unit and End-of-Book Tests in Sullivan.	Teacher judgement was predominant means of assessing progress.	Site now uses the concept of mastery and applies assessment to individual students. The innovation uses teacher judgement rather than a specified criteria to determine mastery. (The End-of-Book Tests are inadequate in the selection of and number of items.)	
5. (OC) A prescription sheet directs teacher-student interactions in Sullivan Books 1 and 2.			
	Students are paced through Books 1 and 2	Not applicable.	Both site and the innovation now use a prescription sheet for Books 1 and 2.	

Table 1 Continued

6. (OC) Sullivan Worksbooks and Tapebooks are available in the "Modification Compact Version" for Books 15-17. This version has the workbook and tapebook pages in the sequence designated on the prescription sheet and they are laminated for re-use.			
Sullivan Workbooks and Tapebooks are kept together in a binder and used as specified on the prescription sheet.	Not applicable.	Both Site and the innovation now use a "Modified Compact Version" of Books 15-17.	
B. Selected Directed and Skills Reading			
1. (OC) The books used for Selected Reading are those that are included in the Scholastic Reading Kit.			
The Selected Reading books are used as specified in the Selected Reading lesson plans.	The library loan program at site was a form of Selected Reading.	Implementation systematized site's practices in the area of Selected Reading and altered the materials of the innovation. (The size and number of schools in site made it difficult and expensive to supply selected materials. Scholastic Kit emerged as a similar but self-contained program.)	The alteration of the materials also effected the objectives of the program.

Table 1 Continued

2. (OC) The materials used for the Skills Reading program are sometimes supplemented or replaced by the Educational Progress Corporation materials.			
The Skills Reading materials are used as specified by the Skills Reading program.	Reading skills were taught as part of the basal reading program.	Skills instruction in reading became individualized and taught outside the basal reading group. The materials of Skills Reading were altered. (The size of site and the number of schools involved made it difficult and expensive for them to supply the materials required by the Skills Reading program. EPC emerged as a self-contained replacement.)	The use of Educational Progress Corporation materials altered the objectives for Skills Reading in some classrooms.
3. (OC) The Library and Reference Skill units of the Skills Reading Program are taught in library and language arts.			
The Library and Reference Skill units are to be used as specified in the Skills Reading Program.	Site taught library and reference skills in the library and language arts programs.	Sites librarians and language arts teachers have the Library and Reference Skill units available to them. The innovation no longer contains those units. (The size of site and the number of schools involved made it difficult and expensive for them to supply all the reference materials referred to in the Library and Reference Skills units.)	
4. (OC) Teacher or aide gets instructional materials for students in IPI Math and Skills Reading.			
Students get their own materials for IPI Math and Skills Reading.	Textbooks and other instructional materials were either kept by the student or distributed by the teacher.	(Not a mutual adaptation.) User Practice. (The storage shelves and storage centers required for pupils to get their own materials would be too expensive due to the number of schools involved.)	

Table 1 Continued

C. PEP		
1. (OC) Classification unit 7 and Quantification units 8, 13, and 14 have been eliminated.		
Classification and Quantification objectives are to be used as specified.	Site kindergartens did not teach these objectives.	(Not a mutual adaptation.) User practice. (The objectives are not generally taught at this grade level and are extremely difficult to teach.)
2. (OC) Classification units 4 and 5 are not necessarily taught in the specified sequence. Group instruction is used for these skills.		
Classification units 4 and 5 are taught following mastery of unit 3. Individualized materials are predominant means of instruction.	Not applicable.	Site teaches Classification 4 and 5. The sequence of units for Classification as specified by the innovation is not foloowed, now are materials individualized. (This alteration is necessary for the innovation to articulate with the science program.)
3. (OC) The General Motor program is taught by some physical education teachers.		
General Motor is a part of the PEP curriculum.	Many skills of the General Motor program were considered to be part of a physical education program.	Some site physical education teachers now teach the General Motor program and, in those instances, it is not part of the PEP curricula.

Table 1 Continued

4. (OC) Teacher judgement is used to assess student behavior when they begin to work in a PEP skill. Post testing is done when students complete work on a skill. Post test material is the same format as lesson material and teacher judgement determines mastery level.				
	Pre and Post tests are used to determine the student's needs within a unit. Special testing materials and setting are used.	Teacher judgement determined a group's needs in a unit. Testing was done in a group setting and group standards determined mastery.	Site has altered its practices by focusing on individual rather than group needs. The innovation has been altered to diagnose needs within a skill rather than within a unit. Level of mastery is determined by the teacher rather than a specified score. An instructional format is used for testing rather than the specialized PEP testing format. (Removal of specialized testing procedures allows both adults to be available for instruction in the PEP timeblock.)	The branching hierarchy is not manageable in this situation. It is now a linear hierarchy. Also, the testing role and testing space have been altered.
5. (OC) Learning centers and AIMS materials are often used rather than boxes in PEP.				
	Boxes are predominant materials for instruction in PEP.	Not applicable. Learning centers and AIMS emerged as innovations that were applicable to PEP.	Site and the innovation now uses AIMS materials and learning centers (The AIMS materials and learning center idea were emergent innovations that were applicable to site and the innovation.)	In some classes, AIMS objectives that are not a part of the PEP curricula are added to the program.
6. (OC) At least forty-five minutes a day, three days a week are spent in the PEP curricula.				
	At least sixty minutes a day, five days a week are spent in the PEP curricula.	Not applicable. Instructional time was not organized around PEP blocks.	Instructional time is organized as specified by IEP, but the time period is shorter. [Site has one-half day kindergarten sessions into which PEP, conventional kindergarten curricula and special classes (physical education, library, etc.) must be scheduled.]	

Table 1 Continued

D. IPI Math		
1. (OC) When students leave the Quantification program they work in either Contenintal Press or A-level IPI Math materials before beginning B-level IPI Math.		
When students leave Quantification they begin work in B-level IPI Math.	Not applicable.	Both site and the innovation now use the Contenintal Press or A-level IPI Math materials. (They provide a necessary transition from Quantification to IPI Math.)
2. (OC) A Metric Education program is used in place of Systems of Measurement in IPI Math.		
The objectives and materials of the IPI Math program are used as specified.	Not applicable.	Site follows their own group instruction procedures for teaching Metric Education as part of IPI Math. The innovation includes a metric unit rather than systems of measurement.
3. (OC) Group instruction has replaced individualized instruction in the IPI Math skills for money, time, geometry, and systems of measurement.		
Individualized booklets are predominant means of instruction in IPI Math.	Group instruction was the predominant means of teaching math in site.	Implementation resulted in site using individualized materials to teach basic math skills (addition, multiplication, etc.) and the innovation was altered by the use of group instruction for the teaching of other math skills (money, time, etc.). (The size of site and the number of schools involved made it difficult for them to maintain an inventory and control the cost of the IPI Math program. It should also be noted the site was criticized by parents for its lack of group instruction in math.)

Table 1 Continued

4.	(OC) Teaching booklets for eight IPI Math skills were eliminated because they were ineffective.			
	Teaching booklets are used to teach each objective in the IPI Math program.	Site did not use materials that they considered to be inneffective.	(Not a mutual adaptation.) User Practice.	Elimination of ineffective materials is considered to be a program completion alteration.
5.	(OC) In IPI Math teacher judgment is used to determine student's needs within a skill. Skill tests determine further needs after completion of the skill.			
	Pre-tests are used to determine needs within a unit and skill. Skill tests are used to determine mastery upon completion of a skill; post-tests are used to determine mastery upon completion of a unit.	Teacher judgment determined group needs within a skill and unit. Teacher judgment and tests determine needs upon completion of a skill or unit. The concept of mastery was not necessarily applied to all skills.	Site now applies the concept of mastery to most skills. A measure of mastery is taken when individuals enter and complete a new skill. The innovation no longer relies on unit pre and post tests and criterion scores for mastery. (The size of site and the number of schools involved made it difficult to maintain an inventory and supply of the testing materials.)	
6.	(OC) Students are engaged in IPI Math at least fifty minutes, every day.			
	Students are engaged in IPI Math at least fifty minutes, every day.	Minimum number of minutes for math was determined by state requirements.	(Not a mutual adaptation.) User practice.	

Table 1 Continued

7. (OC) In almost all cases, students are assigned all pages in IPI Math instructional booklets.			
	Pages assigned in IPI Math instructional booklets are individually selected for students and based on diagnostic test results.	Math lesson plans and assignments were in reference to group needs rather than individuals.	(Not a mutual adaptation). User Practice. Assignment is the same for all.
8. (OC) When beginning work in IPI Math, groups of students are assigned the same unit and paced through the instructional materials.			
	When students begin IPI Math, they are assigned a placement test which determines their beginning unit.	Teacher judgment was used to determine the beginning math unit for a group of students.	(Not a mutual adaptation.) User Practice. (Placement test failed to discriminate between students so that most of them started in the same unit.)

3. Analysis of the Data

Initial examination of the operational characteristics reveal that bilateral change was a prevailing phenomena. In some instances only the user was altered and the program specifications were used as designed; in other instances only the program was altered and the user operated according to previous practices; finally, and in the majority of cases, both the user and the program were altered. This final case represents the bilateral change event and may be observed on Table 1 in the mutual adaptation data.

Examination of these mutual adaptations reveal that two distinct groups exist. One group may be described as a mixture of pieces of the related program specification and the user practice. For instance, one such mutual adaptation indicated that students do not progress until they master the given objective, but that teacher judgment is used to determine mastery rather than the mastery criteria. Here, the innovation is being operated as specified but teacher judgment replaced the mastery criteria. This entire group of mutual adaptations may be the result of the size of the unit being examined. Smaller units would indicate that (a) students do not progress until they master a given objective as specified by the innovation, and (b) teacher judgment is used to determine mastery as indicated by the user practice.

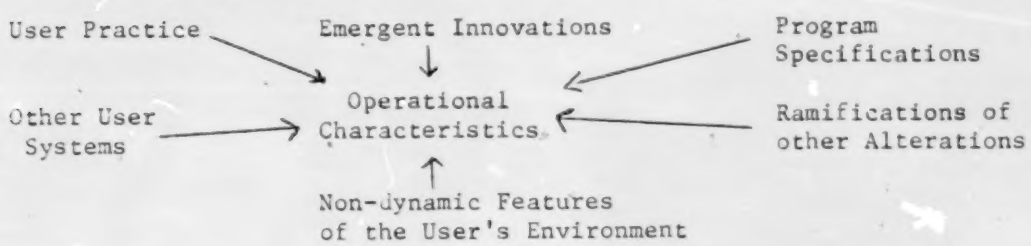
The other group of mutual adaptations are those that are actually different than both the related program specification and user practice. The use of the Scholastic Reading Kit to teach Selected Reading represents this type of alteration. Both groups of operational characteristics comply with the previously discussed definitions of mutual adaptation offered by Wirt and McLaughlin. However, the latter group seems to be more compliance with the definition of synergy offered by Fuller.

The mutual adaptations indicate that in some cases pieces of the innovation were deleted; in other cases pieces were added to the innovation; and in still other cases substitutions were made. The elimination of certain units from the PEP program represents program deletions. The inclusion of Continental Press and A-level IPI Math materials represent additions to the innovation. The use of basal texts, rather than the specified materials, to teach Directed Reading, illustrates a substitution. The fact that these types of alterations could be made to the programs without disrupting the entire systems indicates an advantage of segmentable programs. Pieces can be dropped, added and substituted; and the programs remain stable.

Whether the study has demonstrated the synergistic nature of implementation is not clear. Certainly, the system of operational characteristics is unique and unpredicted by the component systems. However, it is necessary to question whether this reflects synergy or the naivety with which the component systems were initially considered. For instance, Figure 3 shows a reconsideration of these component systems. The operational characteristics may still be unpredictable from this more complete set of components. However, this set of components may be used to explain the emergence of the operational characteristics.

Figure 3

Paradigm for Implementation Reconsidered



These components will be explained and discussed further in this analysis. Presently, it is important to note that further study is necessary to determine whether this paradigm adequately explains the operational characteristics at other sites using the LRDC model and at sites using other models of instruction.

Interestingly, it is not the dicotomous relationship between the innovation and the user that is seen as causing these alterations. The alterations are the results of decision making situations. The decision making situations are seen as being caused by certain conditions of the innovation and the user. These conditions which provide the opportunity for decision making are identified and discussed in the following narrative.

There are certain features of the user's environment which are non-dynamic and do not adjust to the needs of the innovation. References in the data to time and the size of site illustrate this condition. The Selected, Directed and Skills Reading programs require many reference materials. Districts operating this program in one or two buildings have no difficulty providing them in learning material centers. Each center can service as many as eight classrooms. However, site would need seven such centers; some of which would service only two classrooms. Thus, the programs cost two and one-third times more to operate rural site than in a more urban setting.

The innovation is effected by other programs that the user operates. As the innovation becomes part of the user's system it interacts with other programs and is changed. (Likewise, the other programs are changed.) For instance, the user's third grade reading program needs to articulate with the fourth grade reading program. The use of the fourth grade basal reading series by the Group Directed and Directed Reading programs makes the transition from one program to the other easier for students.

The adoption of the General Motor curriculum by some physical education teachers serves to further illustrate this point. In this instance, a program operating at the same grade level effects, and is effected by, the innovation.

Emergent innovations also effect the innovation. This is particularly true of the PEP/IPI Model which has served as an exemplar for a type of individualized instruction. The use of AIMS materials and the Educational Progress Corporation materials serve to illustrate this condition.

Many of the alterations occurred as the user completed the innovation. User completion alterations may be exemplified by the development of a prescription sheet for Sullivan Books 1 and 2. This prescription sheet organized teacher-student activities that were necessary for pacing students through these books and made it easier for the teacher to conduct the program. Thus, it is considered to be a completion activity.

Finally, many of the alterations were the ramifications of other alterations. In programs that are as systematically designed as these innovations, alterations made to one specification will impact related specifications. This is particularly observable in the alterations made to instructional materials; they almost always effect the curriculum structure and, frequently, the assessment system.

Although evaluative judgments concerning the effectiveness of the programs was not within the scope of the study, it certainly must be considered as a condition which could provide for an alteration. The elimination of eight IPI Math booklets was related, by the user, to the ineffectiveness of the materials. The limited items tested on the Sullivan reading tests, and the inability of IPI Math placement test to discriminate between students, were cited as reasons for altering or eliminating their use. It should be noted that some alterations to the IPI Math tests were in agreement with Holland's recommendations concerning testing in IPI (1975, pp. 26-28). Coincidently, Holland's research was also unable to find an advantage to the use of branching hierarchies (1965). This would support site's decision to make PEP into a linear, rather than branching hierarchy. Thus, in some instances site reported ineffectiveness of materials as being the reason for alterations and in two cases their alterations were in agreement with Holland's concerns of program effectiveness.

Within the study, the innovation and the user have been thought of as being in analogical relationship. That is, every program specification has a corresponding user practice. The construction of the analogical systems was, in itself, an informative process. The following discussion concerns some insites into implementation provided by the construction.

As previously discussed, the dicotomous relationship between the innovation and the user do not cause the alteration. They may, however, be in conflict with one another. Some conflicts are very obvious. For example, the innovation specifies that students in Quantification should learn numbers and numerals beyond one hundred. This is in direct conflict with the user's belief. They believe that students will benefit more from extended work with lesser numerals. Informally, the user will most always prevail in these direct conflict situations.

Some conflicts are not as obvious. They involve differences in priority rather than dicotomous sides of the same issue. For instance, IPI Math specifies procedures for placement testing students. All teachers perform this same function. They may not be conscious of it, or they may carefully match the ability of children and the possible beginning units for instruction. Opposition or acceptance of placement testing is more likely to be based on the outcomes and context elements of the activity rather than on the activity itself. Thus, the conflict, and the decision making to resolve the conflict will not occur until after the user has tried the procedures.

This indirect conflict indicates that there is a lag between installation of the innovation and feedback concerning use of the innovation. For designers to be aware of the usefulness of their products, they must be in continuous contact with information regarding what users are presently doing.

A major difference between the innovation and user system that can be viewed during analogical construction is the stability of the descriptions. The program specifications represent an extremely stable pattern when compared to the user

practices. That is, they are the same from one time to another, one teacher to another, and one student to another. In short, they do not change. Both user practices and operational characteristics are much more flexible. Thus, in implementation, users must not only adopt and learn a new program but they must also become standardized in their practices. It is, perhaps, much more difficult for designers to standardize the practices of user's than it would be to design more flexible products. Product flexibility may be achieved by describing different ways to achieve the same goal or achieving slightly altered goals.

Another major difference between the two systems is their relationship to the goals and purposes of the innovation. The designers goals and purposes may be thought of as focusing their awareness. That is, the program specifications that they use must be within the domain defined by their goals and purposes. On one hand these act to guide the selection of appropriate specifications and provide an integrity to program design; on the other hand they act as blinders for program design. The user is not necessarily blinded in the same manner, nor is his integrity necessarily tied to identical goals and purposes. In short, the user has the potential of being aware of a greater domain of alternatives than the designer. One may conclude that user's may have much to offer to designers in terms of alternative program specifications, goals and purposes.

In summary, the notion of bilateral change, as developed earlier in this study, has been shown to be applicable to studying implementation: both the innovation and the user were altered. Also, some alterations were unique and unpredicted by the program specifications and user practices, demonstrating that synergism seems applicable to the study of implementation.

Operational characteristics that differ from program specifications and user practices were identified as mutual adaptations. Two types of mutual adaptations were discussed: those that were mixtures of and those that were

actually different than their related program specifications and user practices. Furthermore, mutual adaptations were viewed as adding pieces to the innovation, deleting pieces from it and substituting pieces.

Alterations to the programs were related to conditions of the innovation and user which provide the opportunity for decision making situations. These situations result in the programs alterations. The conditions discussed were; (a) the non-dynamic features of the user's environment, (b) the other programs that the user operates, (c) emergent innovations, (d) the incompleteness of the innovation, (e) ramifications of other alterations, and (f) the evaluative judgments of the user.

The analogical construction used in the study revealed that some conflicts may not occur until after initial implementation. This finding, combined with the discussion of the relationship of the user and designer to the goals and purposes of the innovation indicate a need to establish and maintain feedback systems from users to designers.

The construction also revealed that user systems are more flexible than the program specifications. Thus, it may be beneficial to consider building more flexibility into program design.

CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

The study has clearly shown that the innovation was impacted during implementation. Further study is needed to examine the impact of implementation on the innovations at other sites using the LRDC model. Also, the study needs to be replicated with the operation of other innovations.

Of equal importance is the need to further study and clarify the conditions and decision making that leads to the adaptations. It is necessary to determine whether these conditions are universally applicable, whether they apply to other sites using the LRDC model and whether they apply to sites using other models.

Clearly, users, designers and implementors need to know more of these decision making situations. Are there "best" decisions? The problematic nature of this question can be found in the study's identification of two major user decisions which both contradicted the models design and agreed with Holland's research on effective programs. Interestingly, Wang's self-scheduling program (1974) illustrates how one may achieve greater flexibility without sacrificing specificity. The program allows for variance in user environment and other programs that they operate.

Within the context of bilateral change, it is important to consider the impact that implementation has on the user. While this impact is observable in the data concerning mutual adaptations on Table I, it must be noted that the user system examined here was in analogy to the innovation. Certainly, the user's system exists aside from that analogue. It has its own goals, purposes and practices that have not been considered in this study. The obvious counterpart to this study would be one focusing on the user system rather than the innovation system.

Further study is also needed to examine how these operational characteristics have altered the goals and purposes of the innovation. The writings of

Deutsch (1966) and Tolbert (1972) clearly indicate feedback systems that would be useful in this process. These feedback systems have been shown to be an essential learning aid to the designer.

The extent to which "synergy" applies to implementation needs further clarification. This study has made progress in defining some of the component systems but much work needs to be done in that area.

Finally, the study has shown a need to re-think the implementation process. Implementors and designers are no longer working with a process of moving a user from a state of tension caused by goal-distance to a state of homeostasis caused by goal achievement. It has been shown that the goals as well as the user, are in motion. Implementation, from this perspective requires steering systems. Such systems must rely on knowledge of where the user is and what the changing goals of the innovation are. Within the system the goals (or goal-images) assume a tactical importance. Of real importance is the purpose of the user and designer working together. The notion and applicability of steering systems for implementation need extensive clarification. However, is should be clear that the only real purpose of the organizations working together is to achieve educational excellence for children. (That, too, needs further study and clarification.)

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